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THE ROLE OF THE TERRAIN ANALYSIS CENTER (TAC) IN
MANAGING THE USE OF MULT. (U) ARMY ENGINEER TOPOGRAPHIC
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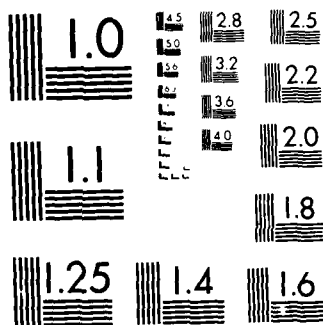
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Through this presentation and other information to be disseminated in the future, terrain analysts and other Army users will better comprehend the potential of MSI in helping them to perform their mission. We certainly do not wish to assert that MSI can solve all the terrain analyst's problems--it certainly cannot--but it may help with some of them.



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THE ROLE OF THE TERRAIN ANALYSIS CENTER (TAC) IN MANAGING THE USE OF MULTISPECTRAL IMAGERY (MSI) FOR THE UNITED STATES ARMY

Introduction

Commercially produced multispectral imagery (MSI) promises to play an increasingly important role for terrain analysts and others in the United States Army in future years. There are several reasons for this.

First, some useful types of quality imagery may not be as plentiful in the future as they have been in the past, and MSI can help to fill the void.

Secondly, commercially produced imagery is not classified, and is therefore easy to handle and store, particularly in field environments.

Thirdly, the resolution of MSI is slowly improving, making it more useful for detailed analysis.

And finally, techniques for computerized multispectral classification and image enhancement, potentially useful tools for terrain analysts, should become more readily available.

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Through this presentation and other information to be disseminated in the future, terrain analysts and other Army users will better comprehend the potential of MSI in helping them to perform their mission. We certainly do not wish to assert that MSI can solve all the terrain analyst's problems--it certainly cannot--but it may help with some of them.

Terrain Analysis Center

The Terrain Analysis Center is a production element of the U.S. Army Engineer Topographic Laboratories, located in the Humphreys Engineer Center.

We are a comparatively small organization at this time, with about 40 people--mostly civilian--making up three divisions and a headquarters element. We have several important missions, all of which relate in some way to terrain analysts throughout the Army.

To better accomplish these missions we are in the process of restructuring the center.

Under the new organization we increase our total authorized civilian strength from 40 to 60. We are also authorized up to eight military personnel. The two production divisions now become the Terrain Studies Division, responsible primarily for production of the Army Intelligence Survey and Tactical Terrain Analysis Data Base (TTADB); and the Military Hydrology Division, which is responsible for all water-related analysis. It also manages the Water Detection Response Team, an ad hoc group which travels the world as the need arises to assist in the detection of subsurface water.

Both of these divisions have the capability to respond quickly to short notice requirements where terrain or water information is needed quickly.

The new Product Generation Division has been created in response to an increased role in data base management. This division is responsible for building and maintaining the Water Resources Data Base, and also has the mission of providing transformed digitized data through the Army Digital Data Support Facility (ADDSFAC).

Our Program Support Division is made up of two elements. The Collection and Technical Support Branch maintains a large collection of geographical information covering many parts of the world which is available both to inhouse analysts and to terrain analysts and other users outside of TAC. The Carto/Repro Branch provides inhouse support.

The newest element of our mission is that of managing MSI for the Army. This responsibility will likely be part of the Product Generation Division, or it may exist as a separate entity.

Definitions

There are a number of common terms and acronyms relating to images using portions of the electromagnetic spectrum. We use the term MSI--multispectral imagery--but you may also

hear MBI--multiband imagery, or HSI--hyperspectral imagery. For our purposes, MSI and MBI are interchangeable; they both allude to the fact that two or more 'images' of an area are taken, each emphasizing the particular sensitivities of different portions of the electromagnetic spectrum. These can be combined and compared in a variety of different ways to highlight different features.

Broad, satellite coverage of hyperspectral imagery, or HSI, should be available in the mid-1990's. Whereas presently we cover rather broad 'bands' of the spectrum, HSI will take advantage of minute differences within those bands. We now deal with only a handful of different bands, but with HSI we are talking about literally hundreds of discriminations, which, when used in combination, may form the equivalent of 'fingerprints' for types of vegetation, soils, etc.

Memorandum of Understanding

A Memorandum of Understanding between Eros Data Center (EDC), United States Geological Survey and the U.S. Army, now being finalized, delegates to the Terrain Analysis Center the authority to monitor and manage the use of MSI within the Army.

A few pertinent passages clarify our specific role:

"...EDC and the Army MSI Manager...Terrain Analysis Center, will monitor and coordinate U.S. Army procurement of MSI in an effort to reduce costly multiple purchases of data and services with user groups that could be sharing the same data."

Also...

"...U.S. Army will...designate the Terrain Analysis Center...as the Army MSI Manager. In the short term, USAETL-TAC will primarily track MSI purchases within the Army to avoid duplicate purchasing...In the long term, USAETL-TAC will monitor purchases, handle funding, serve as a repository (limited), and perform other functions in accordance with procedures which will be established."

Acquisition of MSI

At the present time most purchases of MSI are made through Defense Mapping Agency (DMA). Individual requestors, after having provided funds to DMA, can order standard products through them. They, in turn, forward the orders to EDC, who

deals with Earth Observation Satellite Company (EOSAT). EDC makes the products, ships them to DMA, and bills DMA, who pays with funds from your account. DMA ships the products to you.

In the near term the procedure gets somewhat more complex because (1) more sources of imagery are becoming available; (2) User Groups, rather than individual users will be involved; (3) a wider range of products may become available; and (4) TAC will be monitoring MSI purchases to preclude multiple purchases within User Groups. Turnaround time should not increase.

In the long term DMA gets out of the loop and TAC, the MSI Manager becomes the focal point, maintaining some materials and paying bills. Materials are shipped directly to User Group POC's or to individual users. (The specific flow of orders, money and materials has not been worked out.)

So how do you order MSI? You continue as in the past, ordering through DMA, until you hear differently. When TAC gets more involved in the process, or when there are changes in the system, concerned parties will be notified.

The new MOU guidance lists about 12 items of information which are required as a minimum to order MSI materials. It makes one wonder what the maximum amount of information might be. We will try to keep things as simple as possible.

User Groups

The term "User Groups" may be new to some. EDC would probably like to sell separate copies of each sheet to everyone in the world; it's their business. On the other hand, the Army probably wants to keep costs as low as possible and would be happy if all users used the same sheet, in which case EDC would probably need to go out of business.

The compromise position has been to establish 19 User Groups. Within these User Groups all personnel will be authorized to circulate and share the same materials; further, they will be expected to share the same materials. Sharing purchased materials between User Groups, however, is in violation of copyright law and will not be authorized.

Terrain analysts have not been the primary users of MSI products in the past, nor is it anticipated that they will be the primary users in the future. Most imagery in recent years has been purchased and used by (1) 18th Airborne Corps, (2) Foreign Science and Technology Center, (3) Cold Regions Research Engineering Labs, and (4) EUSAREUR. If MSI is ever used extensively in terrain analysis, it is likely to be as a

function of accessibility, cost, image resolution, and education.

Accessibility

Not everyone can expect to get first priority of delivery of materials. Efforts will be made to get it to the people who need it the most first. If we have a war going on in Mexico, and you are doing a terrain study of the Faeroe Islands, you may need to wait a few extra days.

Generally we may expect a turnaround time of at least a few weeks for Landsat and SPOT. Most requirements should be submitted prior to the first of each fiscal year, and a schedule will be established and followed. Short term requests should be the exception rather than the rule.

Cost

Multispectral imagery can strain budgets. Whether it is actually expensive or not depends on what can be accomplished using it, as opposed to using alternative methods for getting the same amount of information. So who pays the bills?

This question is presently under discussion. If the customer needs to pay, it may place a strain on his budget. On the other hand, if all money comes from a central fund, this may lead to excessive or unnecessary purchases.

The likely solution is to have some kind of cost sharing plan where User Group purchases would be subsidized in a sense for requirements identified in the annual request or for requirements due to war or crisis situations. User Groups would be provided the opportunity to pay for unplanned or poorly planned purchases themselves.

We have price lists for Landsat and SPOT imagery, and they are high. And SPOT prices reportedly are increasing sharply as of about 1 June. We would prefer that the costs be lower, but since they are not, we must make up for it through conservative purchasing and shared use within User Groups.

As an alternative approach, TAC is exploring the possibility of purchasing, sometime in the future, equipment capable of providing the Army's hard-copy requirements from digitized MSI data. This would further cut costs, shorten turnaround time, and be more responsive to specific Army needs.

Image Resolution

The original Landsat MSS (Multispectral Scanner) resolution was rather poor compared to what is becoming available now. Landsat TM (Thematic Mapper) is a much better 30 meter resolution, and SPOT Panchromatic is down to 10 meters. You surely can't measure bridge widths with it, but at least it is getting to the point that you can tell where the bridge is. Commercial Russian imagery, which may become available to us, at least for some areas of the world, reportedly will have a resolution of about 6 meters.

TAC's Challenges

Terrain Analysis Center has several exciting challenges and opportunities facing them. They will serve as a central point of contact for Army matters relating to multispectral imagery. They will also coordinate the flow of new information regarding MSI to terrain teams and other Army users.

TAC will shortly have a basis of expertise in the use of MSI which will be exportable to users. Until we have acquired this expertise ourselves, we will still be able to find answers or refer interested parties to people who know the answers.

At a more mundane level, TAC also has the challenge of monitoring MSI usage and, later on, handling the funds used for the purchase of MSI products and services.

We Are Just Starting

The TAC role in managing MSI for the Army is just now being implemented. Many details of this new role still need to be fleshed out, but we are dedicated to doing the best job possible. And we are confident that the Army, and particularly the Army's elite corps of terrain analysts, will be better off because of our efforts.

Prepared by F. David Lee
Terrain Analysis Center
29 April 1988

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